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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/803,712	03/18/2004	Yee-Chia Yeo	TSM03-0760	7832

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EXAMINER	
RAYMOND, BRITTANY L	
ART UNIT	**PAPER NUMBER**
1756	
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09/21/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/803,712	YEO ET AL.	
	Examiner	Art Unit	
	Brittany Raymond	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38,40-49 and 51-75* is/are pending in the application.

4a) Of the above claim(s) *1-37* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *38,40-49 and 51-75* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 38, 40-47, 56, 57, 59, 61, 63-66, 69, 72 and 74 are rejected under 35 U.S.C. 102(e) as being anticipated by Deng (U.S. Patent Publication 2005/0164502)

Deng discloses an immersion lithography method for forming resist patterns comprising: forming a photoresist film on a substrate, which is held by a wafer stage, filling an immersion fluid in the space between an output optical surface and the photoresist layer, exposing the resist film through the immersion fluid, and developing the resist film to form a pattern (Paragraphs 0003, 0009, 0010), as recited in claims 38, 57, 59, 61, 63 and 74 of the present invention. Deng also discloses that the immersion liquid is water and can be doped with one or more additives (Paragraph 0011), as recited in claims 38 and 63 of the present invention. Deng states that acids can be used as additives in the immersion liquid (Paragraph 0025 and 0028), which would be known by one of ordinary skill in this art to make the pH of the water less than 7, as recited in claims 38 and 63 of the present invention. Although Deng does not state that the pH of the immersion fluid is within the ranges of claims 40-43 and 64-66 of the

present invention, it would be known by one of ordinary skill in the art that if an acid is acting as an additive to water, the acid will be diluted and have a pH close to 7. Also, it is known by one of ordinary skill in this art that pH is equal to –log [H+], as shown by Brown (Chemistry: The Central Science). Thus, claims 44-47 are equal to claims 40-43, respectively, and are rejected for the same reasons. Deng also lists several additives that can be used with the water that are fluorinated, such as fluorinated siloxane or fluorinated alkane (Paragraph 0026), as recited in claim 69 of the present invention. Deng discloses that a light source is used to produce light at a wavelength of 248, 193 or 157 nm (Paragraph 0009), as recited in claim 63 of the present invention. Deng also states that a chemically amplified photoresist can be used DUV photolithography processing (Paragraph 0014), as recited in claims 56 and 72 of the present invention.

Deng teaches every limitation of claims 38, 40-47, 56, 57, 59, 61, 63-66, 69, 72 and 74 of the present invention and thus anticipates the claims.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 48, 49, 51, 67 and 68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deng (U.S. Patent Publication 2005/0164502) in view of French (U.S. Patent Publication 2004/0175647).

The teachings of Deng have been discussed in paragraph 2 above.

Deng fails to disclose that the optical surface can be silicon oxide or calcium fluoride.

French discloses that a compound lens can be made out of calcium fluoride or hydroxyl free silica, also known as silicon dioxide, when used in an immersion lithography process (Paragraphs 0190 and 0191), as recited in claims 48, 49, 67, and 68 of the present invention. It is known by one of ordinary skill in this art that silicon dioxide and silicon oxide have similar properties.

Deng teaches every limitation of claim 51 of the present invention in paragraph 2 above.

It would have been obvious to one of ordinary skill in this art, at the time of invention by applicant, to have used silicon oxide or calcium fluoride for the optical surface, as suggested by French, in the process of Deng because French teaches that this type of material does not react with the immersion liquid used and works well with the type of exposure light used in the present invention.

5. Claims 58, 60, 73 and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deng (U.S. Patent Publication 2005/0164502) in view of Levinson (U.S. Patent Publication 2005/0037269).

The teachings of Deng have been discussed in paragraph 2 above.

Deng fails to disclose that the stage and the semiconductor are immersed in the immersion fluid.

Levinson discloses an immersion lithography apparatus comprising a stage upon which the wafer to be patterned is mounted (Paragraph 0018). Levinson discloses in Figure 1 that the wafer region is immersed in the immersion fluid, as recited in claims 58 and 73 of the present invention. It would be obvious to immerse the stage underlying the wafer in the immersion fluid since the stage is part of the wafer region, as recited in claims 60 and 75 of the present invention.

It would have been obvious to one of ordinary skill in this art, at the time of invention by applicant, to have immersed the stage and the semiconductor in the immersion fluid, as suggested by Levinson, in the process of Deng because Levinson teaches that immersing the whole stage and substrate allows for the pattern to be formed properly.

6. Claims 62 is rejected under 35 U.S.C. 103(a) as being unpatentable over Deng (U.S. Patent Publication 2005/0164502) in view of Hirayama (U.S. Patent Publication 2006/0154188).

The teachings of Deng have been discussed in paragraph 2 above.

Deng fails to disclose that the step of developing the photoresist comprises

immersing the photoresist in tetramethylammonia hydroxide.

Hirayama discloses an immersion lithography method for forming resist patterns comprising: forming a photoresist film on a substrate, placing an immersion fluid on the resist film, exposing the resist film through the immersion fluid, and developing the resist film to form a pattern (Paragraphs 0179-0183). Hirayama states that the developing solution can be tetramethylammonium hydroxide (Paragraph 0226), as recited in claim 62 of the present invention.

It would have been obvious to one of ordinary skill in this art, at the time of invention by applicant, to have immersed the photoresist in tetramethylammonia hydroxide during the development step, as suggested by Hirayama, in the process of Deng because Hirayama teaches that this solution is a common developing solution and allows for an accurate photoresist pattern to be formed.

7. Claims 52-55, 70 and 71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deng (U.S. Patent Publication 2005/0164502) and French (U.S. Patent Publication 2004/0175647) as applied to claims 38, 40-49, 56, 57, 59, 61, 63-68, 72 and 74 above, and further in view of Letz (U.S. Patent Publication 2005/0186513).

The teachings of Deng and French have been discussed in paragraphs 2 and 4 above.

Deng and French fail to disclose that a fluorine containing compound can be sodium fluoride, potassium fluoride or hydrogen fluoride, and that the concentration of the fluoride ions is greater than 0.01, 0.05, and 0.1 mol/L, as recited in claims 53-55 and 71 of the present invention.

Letz discloses a composition for an immersion lithography liquid comprising saturating a 4-valent element and carbon or silica, with a hydrogen and a halogen, said halogen chosen from fluoride, chloride and bromide (Paragraphs 0016 and 0017), which means hydrogen fluoride could be used, as recited in claims 52 and 70 of the present invention.

It would have been obvious to one of ordinary skill in this art, at the time of invention by applicant, to have used hydrogen fluoride, as suggested by Letz, in the immersion fluid in the processes of Deng and French because Letz teaches that using this compound allows for a more accurate exposure step of the immersion lithography process. It also would have been obvious to one of ordinary skill in the art to have used the range of concentrations of fluoride ions recited in claims 53-55 and 71 because this concentration determines the pH of the immersion fluid and can be determined by one of ordinary skill in the art without undue experimentation to form the fairly neutral to slightly acidic pH levels recited in claims 40-43 of the present invention.

Response to Arguments

8. Applicant's amendments have overcome the rejection of claims 38-62, 64-66, and 68-70 under 35 USC 112, 2nd paragraph that were presented in the last Office Action. Examiner has withdrawn the rejections.

9. Applicant's arguments, filed 7/5/2007, have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of a newly found prior art reference.

The reference, Deng, has been added to teach an immersion fluid consisting of water and an additive, which can be an acid. Thus, the immersion fluid is water and has a pH less than 7, as recited in claims 38 and 63 of the present invention.

Claims 40-49, 51-62 and 64-75 are rejected for being dependent on rejected independent claims 38 and 63 and due to the prior art references, French, Levinson, Hirayama and Letz, as discussed above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brittany Raymond whose telephone number is 571-272-6545. The examiner can normally be reached on Monday through Friday, 8:00 a.m. - 4:30 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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